TAU-TRON
5902
PRINTER

tau-tron
A UNIT OF
GENERAL SIGNAL
Digital Instruments Division

5902

PRINTER

OPERATION MANUAL

FORM NO. 0355-0186A
PART NO. 8200-0010

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(617) 692-5100 Telex 750245 1-800-TAU-TRON (Outside MA)

WARRANTY

All Tau-tron products are warranted against any defects in material and workmanship. This warranty applies for one year from the date of delivery for all Tau-tron manufactured products. The warranty period for OEM products sold by Tau-tron will depend on the original OEM warranty (consult factory for specific products). We will repair or replace products which, upon our examination, prove to be defective during the warranty period.

NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING FITNESS FOR PURPOSE, MERCHANTABILITY OR OTHERWISE, IS GIVEN.

For assistance, contact Customer Service with details of the instrument model, serial numbers, and malfunction; see Repair Returns below.

SHIPPING DAMAGE

If any signs of damage are noted on the outside of the carton, request that the carrier's agent be present during unpacking. If external damage is found on the instrument, follow Repair Returns procedure below.

Check the electrical performance of the instrument as soon as possible after receipt. If any malfunctions are observed, follow Repair Returns procedure below.

REPAIR RETURNS

For mechanical damage or electrical malfunctions, notify Tau-tron immediately. If the damage occurred during shipping, also notify the carrier. To return a unit for repair:

1. Call the Customer Service Department, (617) 692-5100 (800-TAU-TRON, outside MA), for a Repair Authorization Number. This will reduce administrative delays and ensure prompt return of your unit.

2. Complete and attach the Repair Tag, in the back of the manual, to your unit for positive identification.

3. Pack the unit in the original shipping carton and packing materials, if available. Otherwise use a double-walled carton (test strength of 350 lb; 159 kg) and shock-absorbing material such as bubblewrap to prevent the unit from moving in the carton during transit. Secure the carton by sealing with heavy paper tape.

4. Send to: Tau-tron Inc.
   10 Lyberty Way
   Westford, MA 01886
   Attn: Customer Service

5902
PRINTER

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SECTION 1

INTRODUCTION

1. INTRODUCTION

A. General

1.01 This manual provides the user with all the information required for the operation and maintenance of Tau-tron's 5902 Printer.

1.02 Whenever this manual is reissued, the reason for the reissue will be given in this paragraph.

B. Scope

1.03 The following information is provided:

- Equipment description
- Operating instructions
- Maintenance
- Specifications.

C. Errors, Omissions, and Recommendations

1.04 We would appreciate your comments on any errors or omissions you discover in this manual. When reporting errors or omissions, please be specific and indicate the section number, title, and page number. Also, indicate the paragraph number, figure number, or table designation.

1.05 Your recommendations for improving the quality, contents, and usability of this document are requested and solicited. Please address all correspondence to:

Tau-tron Inc.
ATTN: PUBLICATIONS MANAGER
10 Lyberty Way
Westford, MA 01886

2. DESCRIPTION

2.01 Tau-tron's 5902 Printer is a compact, self-contained 40-column thermal printing system which includes complete control and interface electronics and an AC power supply. The printer is extremely quiet and simple to operate.

2.02 The 5902 Printer consists of a microcomputer-based system which controls the communications and the print mechanism. The system receives data in the ASCII format from either the GPIB, RS-232C, or RS-449 interfaces (only one interface is active at a time). The GPIB interface will operate in both the addressed-listener and the listen-always modes. The RS-232C and RS-449 interfaces offer externally selectable baud rates (from 110 to 9600 bits per second) and externally selectable parity (Odd/Even/None).

2.03 The 5902 Printer can be configured as either DCE (Data Communication Equipment) or DTE (Data Terminal Equipment) via internal jumper plugs. In addition, the RS-449 interface can be selected to conform to either RS-422 or RS-423 electrical characteristics.

2.04 The 5902 Printer prints all upper and lower case ASCII letters, numbers, punctuation, and special symbols (the standard 96 ASCII character set) shown in the ANSI X3.4-1977 specification. The printing is accomplished using a 5-column by 7-row dot matrix character font. The 5902 offers a choice between the Text and List modes of printing. The Text mode is used when a permanent record of test results with the proper format is desired. The List mode is used to print events (e.g., errored seconds) as they happen.

2.05 When equipped with an RS-232C or RS-449 interface, both Primary and Auxiliary interface ports are provided on the rear panel of the 5902 Printer. Data received on the Primary port is printed. Data received on the Auxiliary port is looped to the Primary port unaltered, allowing communication to the test set from a serial controller such as a computer terminal.

2.06 An input buffer of 1024 characters is provided to make the printer capable of simultaneously printing data while more data is being received and stored in the buffer. When the buffer is full, additional data is not accepted until there is room in the buffer for it.

2.07 The 5902 Printer is fully compatible with Tau-tron's line of Digital Transmission Test Set equipment and provides automatic hard-copy records of measurement data and test results. The 5902 Printer can also be used with Tau-tron's optical and lab instrumentation, when equipped with the GPIB interface.

3. OPERATION

A. General

3.01 This section describes the use of all controls, indicators, and connectors of the 5902 Printer.

B. Front Panel Controls and Indicators

3.02 The front panel controls and indicators, as illustrated in Figure 1, show the functional areas. In Table A, the functional areas are further defined, giving descriptive and operational information for each control and indicator.

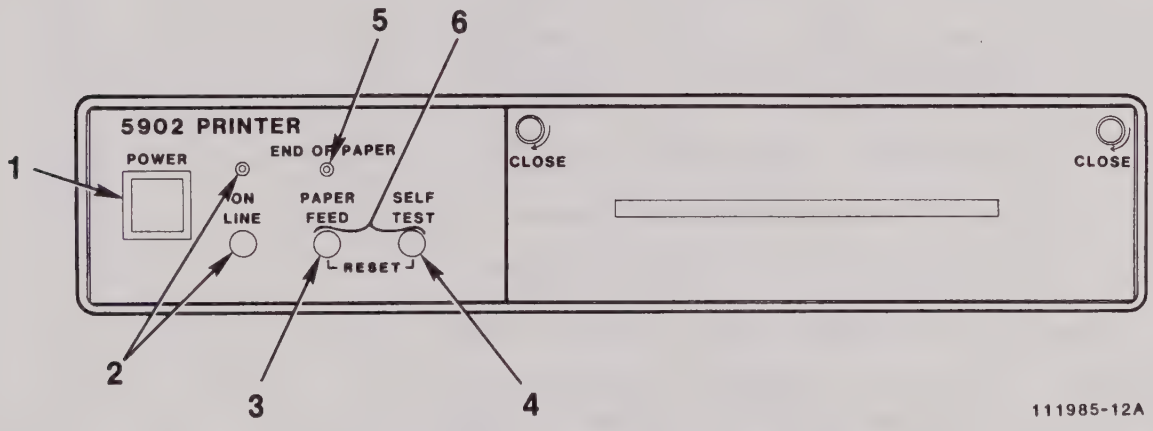

Fig. 1 - 5902 Printer Front Panel Controls and Indicators

TABLE A

5902 FRONT PANEL CONTROLS AND INDICATORS

NO.	DESIGNATION	DESCRIPTION
1	POWER (switch/indicator)	Main AC power switch for the 5902 Printer. When pushed in, the switch/indicator lights, showing that the unit is on.
2	ON-LINE (switch and indicator)	Alternate action selects on-line/off-line . Indicator lights when on-line. SELF-TEST switch is disabled when ON-LINE and data is printed and buffered if not full. When off-line, all communication is disabled; data in the buffer is not lost while off-line.
3	PAPER FEED (switch)	Pressing and holding this switch will feed paper continuously until the switch is released. Will function with the unit on-line or off-line.

TABLE A (CON'T)

5902 FRONT PANEL CONTROLS AND INDICATORS

NO.	DESIGNATION	DESCRIPTION
4	SELF-TEST (switch)	Pressing switch initiates a self-test cycle. Printer must be off-line for this feature to operate. The SELF-TEST consists of the following: • Diagnostic test of ROM memory (checksum) • Diagnostic test of microprocessor RAM and external RAM memory (address and data pattern) • 16 lines of alphanumeric rolling pattern • Character font printed in the List mode • Character font printed in the Text mode Figure 2 shows a sample SELF-TEST printout. The SELF-TEST will print messages to indicate when it starts and when it ends. During SELF-TEST, the name of each test routine is printed, followed by a "test ok" message. If a ROM or RAM test fails, the test will stop and the END OF PAPER indicator will flash at approximately 10 Hz.
5	END OF PAPER (indicator)	On Steady: END OF PAPER on steady indicates that there is only 1 in. (2.5 cm) of paper remaining. When END OF PAPER becomes active, the printer goes off-line, disabling additional data transfer; data in the buffer is retained. (Refer to Section 4 paper replacement instructions.) Flashing: END OF PAPER flashing at 1 Hz indicates that the head release lever has been left in the LOAD position (up, off the paper). (Refer to Section 4 paper replacement instructions.) In SELF-TEST, flashing at 10 Hz indicates a RAM or ROM failure. (Refer to Section 4 Service and Maintenance.)

TABLE A (CON'T)

5902 FRONT PANEL CONTROLS AND INDICATORS

NO.	DESIGNATION	DESCRIPTION
6	RESET (function)	Simultaneously pressing the PAPER FEED and SELF-TEST switches initiates a printer RESET. The rear panel set-up switch is re-read and the software is re-initialized, including clearing the internal buffer. RESET occurs independently of on-line/off-line status.

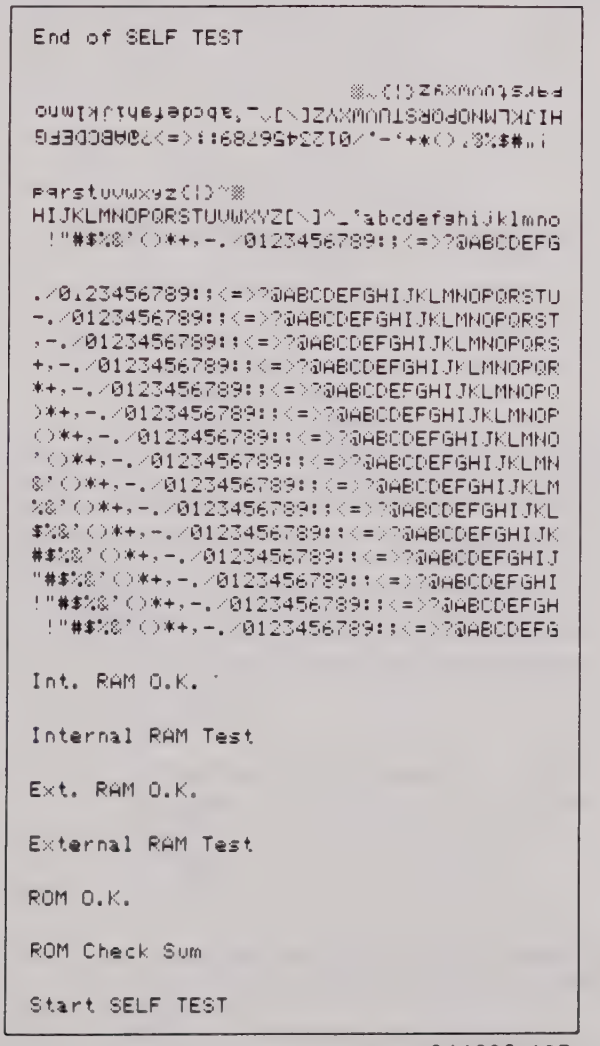

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Fig. 2 - SELF-TEST Printout

C. Rear Panel Controls and Interfaces

3.03 The rear panel controls and interfaces are illustrated in Figure 3 and further described in Table B.

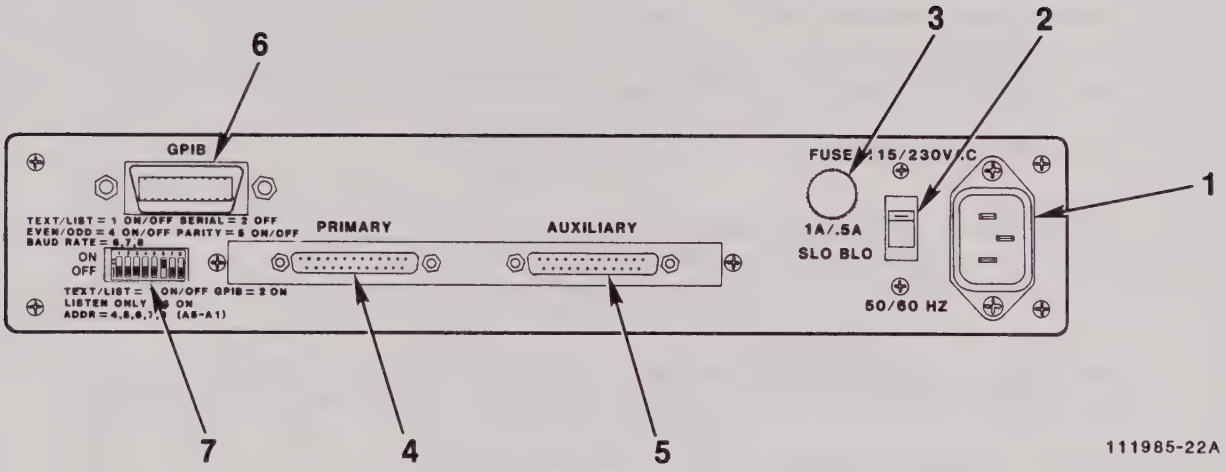

Fig. 3 - 5902 Printer Rear Panel Controls and Interfaces

TABLE B

5902 REAR PANEL CONTROLS AND INTERFACES

NO.	DESIGNATION	DESCRIPTION
1	AC Power Receptacle	The 3-prong receptacle accepts the 115 VAC or 230 VAC from a local power source. A 3-wire ground source must be used.
2	AC Input Select Switch	This switch is used to match the internal power supply to the incoming AC line voltage Up = 115 VAC 60 Hz Down = 230 VAC 50 Hz
3	Fuse Holder	A 1-amp slo-blo fuse is used for 115 VAC. A 1/2-amp slo-blo fuse is used for 230 VAC.

TABLE B (CON'T)

5902 REAR PANEL CONTROLS AND INTERFACES

NO.	DESIGNATION	DESCRIPTION
4	Primary RS-232C or RS-449 Interface Port	RS-232C: Standard 25-pin configuration, female RS-449: Standard 37-pin configuration, female Data received on the Primary interface port is printed. NOTE: For detailed information on RS-232C serial interface characteristics, see Appendix A. For detailed information on RS-449 serial interface characteristics, see Appendix B.
5	Auxiliary RS-232C or RS-449 Interface Port	RS-232C: Standard 25-pin configuration, female RS-449: Standard 37-pin configuration, female Data on the Auxiliary port is looped to the Primary interface port unaltered. This interface port allows two-way communication from a serial controller (e.g., a computer terminal) to the test set (e.g., Tau-tron's S5104) through the 5902 Printer, via the Primary interface port. Figure 4 illustrates this application. NOTE: If the auxiliary RS-232C or RS-449 connector is not used, it may be left open (unterminated).
6	IEEE-488 (GPIB) Interface Port	This optional interface is configured with a standard 24-pin connector (female). The GPIB interface allows the printer to be used with Tau-tron's laboratory instrumentation products and also with Tau-tron's optical products. NOTE: For detailed information on IEEE-488 (GPIB) interface characteristics, see Appendix C.
7	Printer Operating Mode DIP Switch*	This DIP switch is used to select the various operating characteristics of the printer. The configurations are as follows: SWITCH 1: PRINT DIRECTION (Text/List) When the Print Direction Switch is ON (closed), the Text mode is selected. In the Text mode, the

TABLE B (CON'T)

5902 REAR PANEL CONTROLS AND INTERFACES

NO.	DESIGNATION	DESCRIPTION
7	(Con't)	characters appear to be printing upside down. When viewing a page of text mode printing, the last line printed is at the bottom of the page. The Text mode should be used when a printout with the proper format is required for a permanent record (e.g., a parity error summary). Figure 5 shows a sample printout in Text mode. When the Print Direction Switch is OFF (open), the List mode is selected. In the List mode, the characters appear readable when viewing a page of printing; however, the last character line printed will be at the top of the page. The List mode should be used when it is necessary to read the data as printed (e.g., when printing errored seconds as they happen). Figure 6 shows a sample printout in List mode. SWITCH 2: INTERFACE SELECTION (GPIB/SERIAL) When the switch is ON (closed), the GPIB (IEEE-488) interface is selected. When the switch is OFF (open), the serial (RS-232C or RS-449) interface is selected. Only one interface is active at any time. Any connection made to the inactive interface is ignored.
		Switches 3 through 8 must be interpreted according to the interface that is selected.
		RS-232C or RS-449 INTERFACE Switch 3 Not used. Switch 4 Parity type. ON (closed) selects even parity. OFF (open) selects odd parity. Switch 5 Parity enable. ON (closed) enables parity. OFF (open) disables parity. If enabled, the received character is discarded if a parity error is detected.

TABLE B (CON'T)

5902 REAR PANEL CONTROLS AND INTERFACES

NO.	DESIGNATION	DESCRIPTION
7	(Con't)	Switch 6, 7, 8 Baud rate selection.

BAUD RATE	6	7	8
110	OFF	OFF	OFF
150	OFF	OFF	ON
300	OFF	ON	OFF
600	OFF	ON	ON
1200	ON	OFF	OFF
2400	ON	OFF	ON
4800	ON	ON	OFF
9600	ON	ON	ON

IEEE-488 (GPIB) INTERFACE

Switch 3 Listen Only. ON (closed) puts the interface into Listen-only (always addressed) mode. OFF (open) is the normal setting for addressed-listen operation. All data received when ATN line is true will be interpreted as printable characters.

Switches 4, 5, 6, 7, 8 Bus address. These switches correspond to address bits A5 through A1, respectively. ON (closed) sets the bit to logic "1." OFF (open) sets the bit to a logic "0." These switches are ignored if Listen Only is selected.

*NOTE: The Printer Operating Mode DIP Switch is read only on power-up or if a printer RESET is initiated.

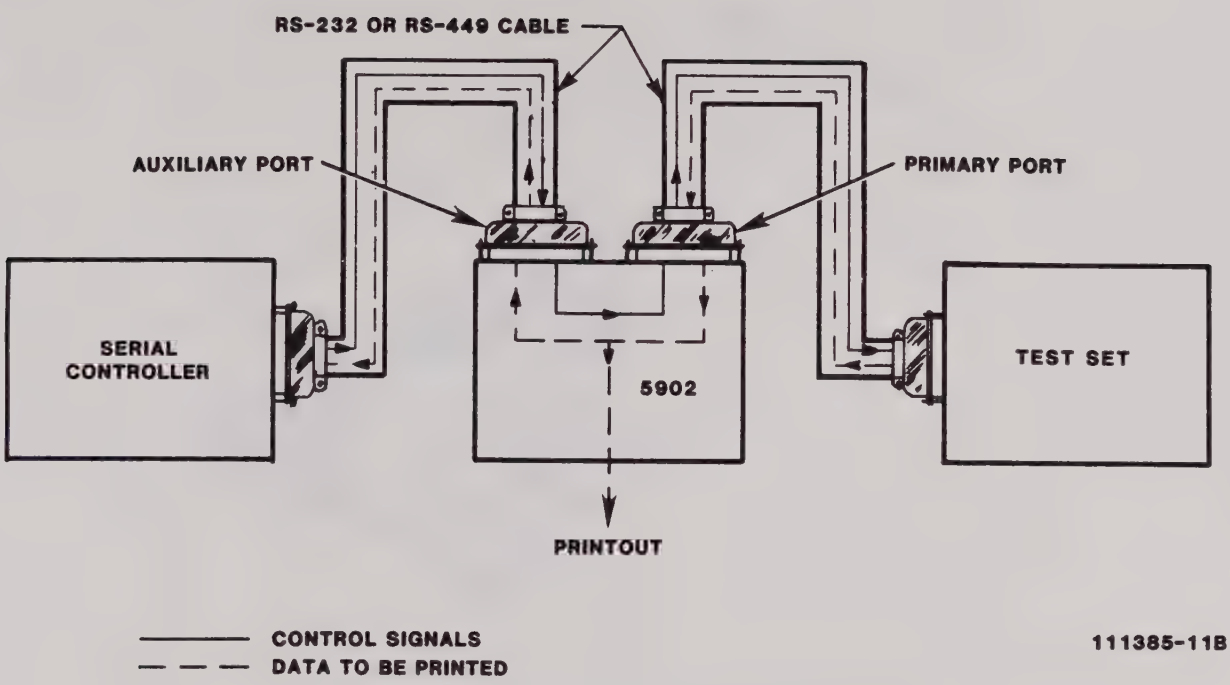

Fig. 4 - Auxiliary Port Application

```
4-14:37:29       IMMEDIATE PARITY SUMMARY
Elapsed Time=00-00:16:23  (983      Secs)

Par Errs=1292611       AvgErrRate =3.0E-05
Err Secs=983           %ErrFreeSec=00.0000
DribErrs=0             DribErrRate=0.0E-12
THRESHOLD ERRORED SEC SUMMARY*
     E-6=983           E-4=0
     E-5=983           E-3=Invalid
STATUS AND EVENT SECONDS:
SigLs=983      Frame=983      Sync=983
 Blue=0        X-Bit=983         A=0
    B=0             C=0          D=0
```

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Fig. 5 - Text Mode Printout

```
6-14:45:27 Bit=        1
6-14:45:04 Bit=        1
6-14:44:35 Bit=        1
6-14:44:34 Bit=        2
6-14:44:32 Bit=        2
6-14:44:21 Bit=        2
6-14:44:20 Bit=        1
6-14:44:19 Bit=        1
6-14:44:14 Bit=        1
6-14:44:09 Bit=        1
6-14:44:02 Bit= 7606815,SigLoss   X
6-14:41:29     RECOVERY FROM POWER LOSS
```

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Fig. 6 - List Mode Printout

D. Internal Jumper Plug Configurations

3.04 The 5902 Printer incorporates jumper plugs on the internal printed circuit board which can be used to select special interface operating functions. The location of the jumper plugs for RS-232C units is shown in Figure 7; the location of the jumper plugs for RS-449 units is shown in Figure 8. The functions of the jumper plugs for RS-232C and RS-449 units are described in Tables C and D respectively.

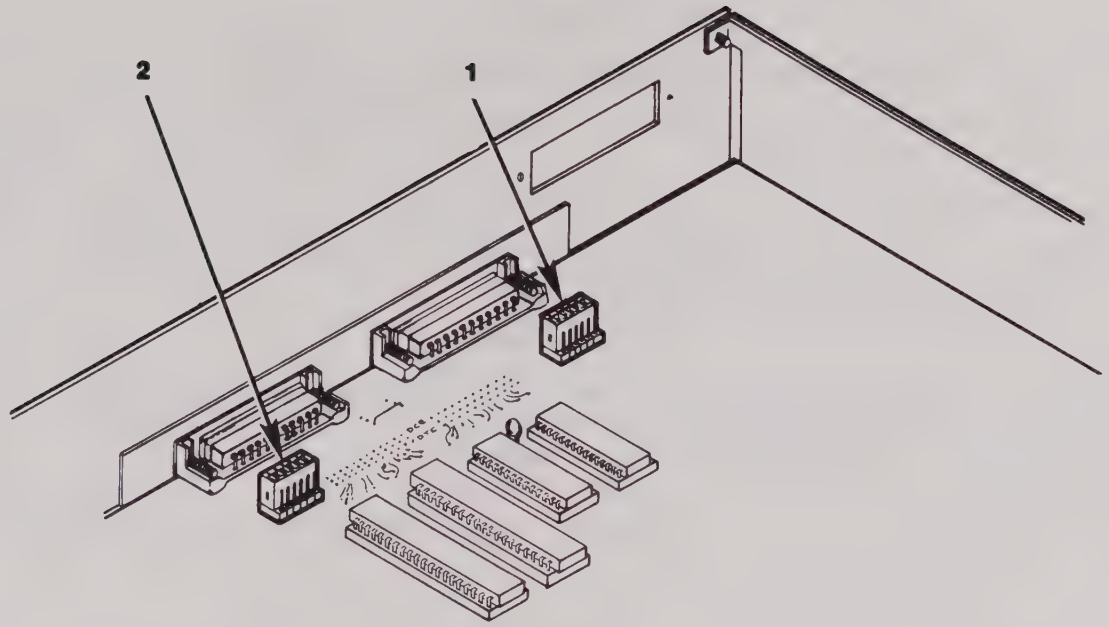

Fig. 7 - Internal Jumper Plugs, RS-232C Units

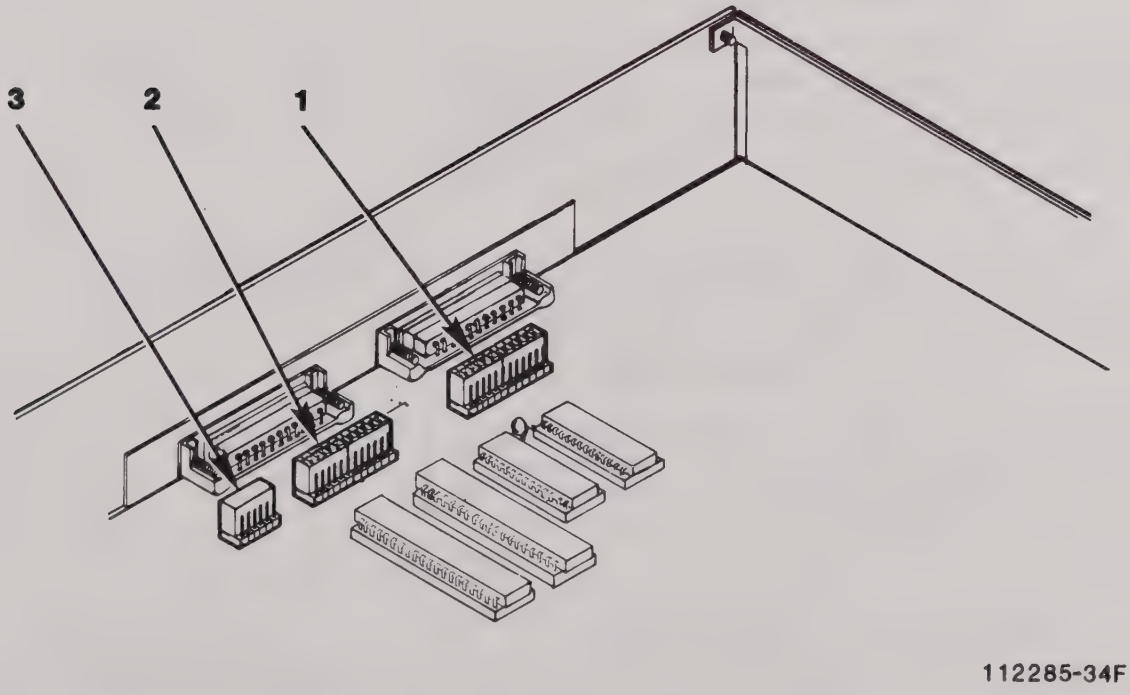

Fig. 8 - Internal Jumper Plugs, RS-449 Units

TABLE C

INTERNAL JUMPER PLUGS FOR RS-232C UNITS

NO.	DESIGNATION	DESCRIPTION
1	Primary port DCE/ DTE select	Configures the primary interface as either Data Communication Equipment (DCE) or Data Terminal Equipment (DTE). Consists of a 6-position ganged jumper plug.
2	Auxiliary port DCE/ DTE select	Configures the auxiliary interface as either Data Communication Equipment (DCE) or Data Terminal Equipment (DTE). Consists of a 6-position ganged jumper plug.

TABLE D

INTERNAL JUMPER PLUGS FOR RS-449 UNITS

NO.	DESIGNATION	DESCRIPTION
1	Primary port DCE/ DTE select jumper	Configures the primary interface as either Data Communication Equipment (DCE) or Data Terminal Equipment (DTE). Consists of two 6-position ganged jumpers. Both must be in the same position for proper operation.
2	Auxiliary port DCE/ DTE select jumper	Configures the auxiliary interface as either Data Communication Equipment (DCE) or Data Terminal Equipment (DTE). Consists of two 6-position ganged jumpers. Both must be in the same position for proper operation.
3	RS-422/RS-423 select	Configures the unit to conform to the electrical characteristics of Balanced Voltage (RS-422) or Unbalanced Voltage (RS-423) Digital Interface Circuits. Consists of a 6-position ganged jumper plug. NOTE: This jumper plug is used only in units equipped with an RS-449 interface.

DTE/DCE Interfacing

3.05 Equipment configured as Data Communication Equipment (DCE) will interface with equipment configured as Data Terminal Equipment (DTE). However, interfacing similarly configured equipment (e.g., DTE to DTE or DCE to DCE) requires the use of a null modem. To avoid this problem and further enhance flexibility, the 5902 Printer is jumper-selectable as either DCE or DTE. The Primary and Auxiliary interface ports are configured at the factory as DCE, so they will easily interface with all of Tau-tron's test sets (e.g., the S5104, the S5200E, etc.) and most serial controllers (computer terminals, etc.) which are configured as DTE.

WARNING: Before attempting to access the internal jumper plugs, AC power must first be removed from the printer.

DCE/DTE Selection

3.06 To access the internal jumper plugs for DCE/DTE selection, the top cover of the printer must first be removed by removing the six screws that secure it to the unit (three screws on each side). The DCE/DTE select jumpers for the Primary port and the Auxiliary port are identical and are located in front of their respective connectors on the printed circuit board near the back of the unit, as shown in Figure 9 for RS-232C units and Figure 10 for RS-449 units. To set either the Primary or Auxiliary port (or both) as DCE, position the appropriate jumper(s) on the back row of pins (toward the rear panel of the printer). Both the Primary and Auxiliary port jumpers are set at the factory as DCE and should already be in this position. To set either the Primary or Auxiliary port (or both) as DTE, position the appropriate jumper(s) on the front row of pins (toward the front panel of the printer).

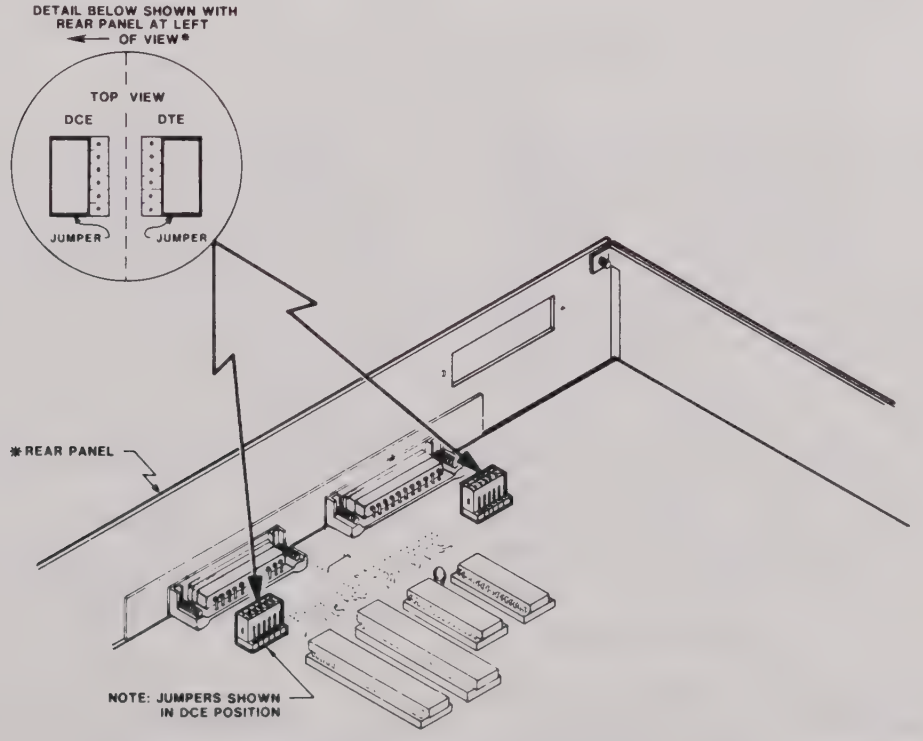

Fig. 9 - DCE/DTE Selection, RS-232C Units

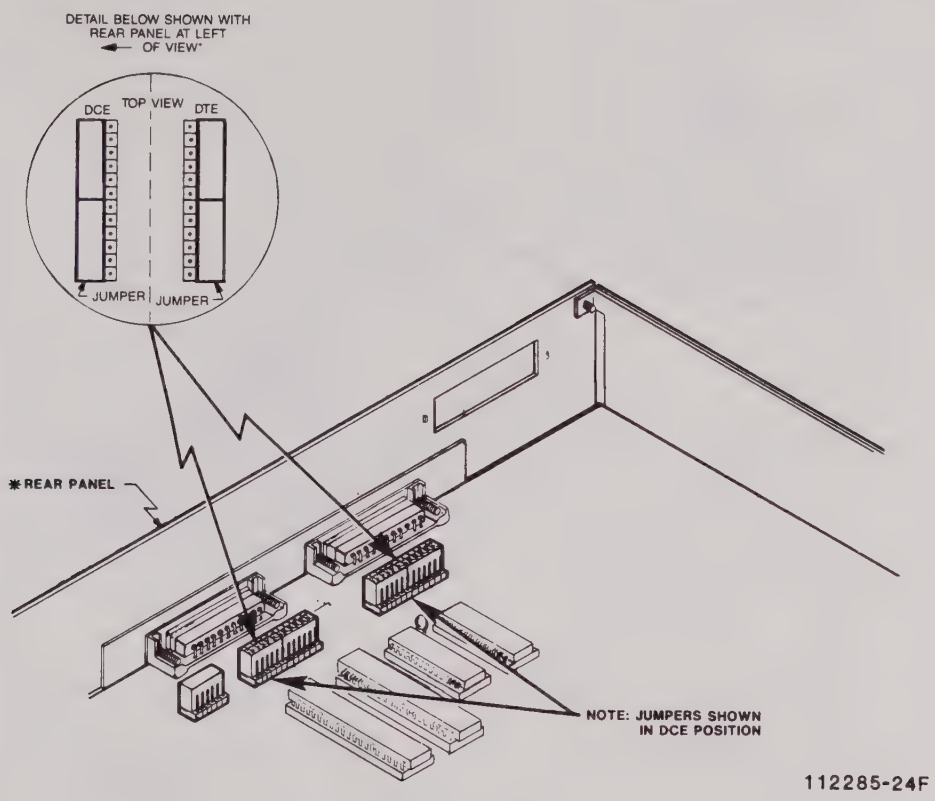

Fig. 10 - DCE/DTE Selection, RS-449 Units

3.07 If a GPIB interface is installed, it will be necessary to remove the GPIB board to access the Primary port DCE/DTE select jumper. This is accomplished by removing the two captive screws on the rear panel, removing the four screws that secure the GPIB board, and pulling the board up and out of the unit, as shown in Figure 11 for RS-232C units and Figure 12 for RS-449 units. To reinstall the GPIB board, simply reverse this procedure.

NOTE: When reinstalling the GPIB board, be sure to seat the board properly and securely into the connector on the printed circuit board.

RS-422/RS-423 Selection

3.08 If the printer is equipped with an RS-449 interface, an additional jumper post block will be provided on the internal printed circuit board of the printer as shown in Figure 12. This RS-422/RS-423 select jumper is used to configure the printer to conform to the electrical characteristics of either Balanced Voltage Digital Interface Circuits (RS-422) or Unbalanced Voltage Digital Interface Circuits (RS-423). To set the printer for RS-422, position the jumper on the back row of pins (toward the rear panel of the printer). The printer is set at the factory for RS-422 and should already be in this position. To set the printer for RS-423, position the jumper on the front row of pins (toward the front panel of the printer).

E. Default Settings

3.09 The 5902 Printer is pre-set at the factory in a configuration compatible with Tau-tron's line of Digital Transmission Test Set equipment. Table E defines these default settings.

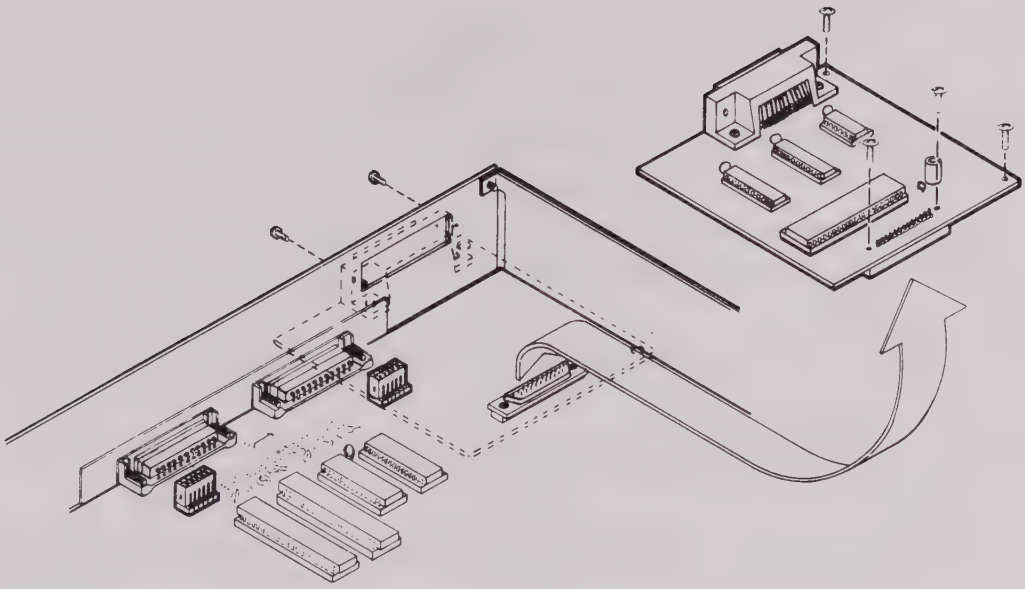

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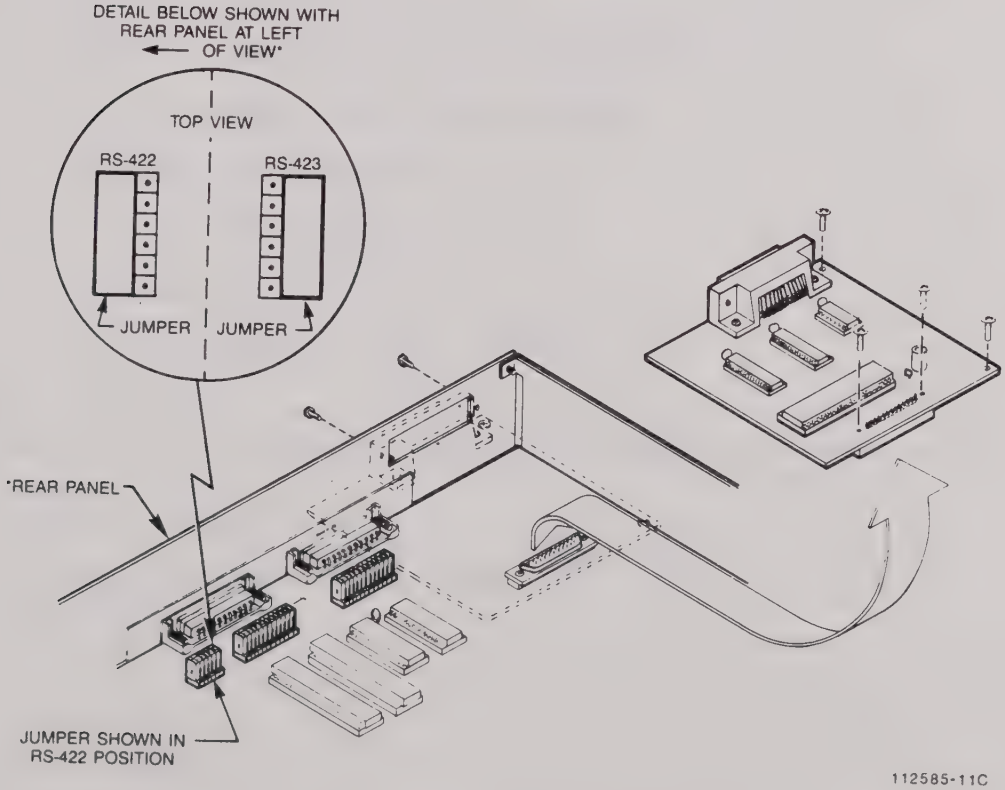
Fig. 11 - Primary Port DCE/DTE Select Jumper Access



112585-11C

Fig. 12 - Primary Port DCE/DTE Select Jumper Access and RS-422/RS-423 Selection

TABLE E

DEFAULT SETTINGS

Interface	Configuration
RS-232C	Primary and Auxiliary interfaces both set as Data Communication Equipment (DCE)
RS-449	Primary and Auxiliary interfaces both set as Data Communication Equipment (DCE) The interchange circuits are factory set to conform to the Electrical Characteristics of Balanced Voltage Digital Interface Circuits (RS-422).
Rear Panel DIP Switch	**Configuration**
Switch 1	OFF = Set for List Mode
Switch 2	OFF = Set for Serial Interface (RS-232C or RS-449)
Switch 3	OFF = Not used for Serial Interfaces
Switch 4	OFF = Parity Disabled
Switch 5	OFF = Parity Disabled
Switch 6	ON } Set the printer for 1200 Baud
Switch 7	OFF } Set the printer for 1200 Baud
Switch 8	OFF } Set the printer for 1200 Baud

F. Power-Up Procedure

3.10 The power-up procedure is given in Table F.

TABLE F

POWER-UP PROCEDURE

STEP	PROCEDURE
1	If you intend to mount the 5902 Printer to the test set being used, refer to Appendix E for instructions. NOTE: The mounting kit is only compatible with the S5104, the S5200E, and the S5250.
2	Check the AC input select switch on the rear panel of the printer to be sure that the correct voltage (115 or 230V) is selected before connecting the power cord to an AC receptacle. NOTE: The unit is shipped from the factory set for 115V.
3	Plug the male end of the printer's power cord into an AC receptacle. Connect the female end of the printer's power cord to the AC power receptacle on the rear panel of the printer. Connect the male end of the test set's power cord to the piggyback receptacle (Figure 13) of the printer's power cord. Connect the female end of the test set's power cord to the AC receptacle on the rear panel of the test set being used.
4	If using an RS-232C or RS-449 interface, connect the straight end of the appropriate interface cable (supplied with the printer) to the Primary port connector on the rear panel of the printer as shown in Figure 14; connect the right-angle end of the interface cable to the appropriate connector on the test set being used. Secure the cable with the screws provided on the ends of the cable. If using a serial controller, connect it to the Auxiliary port of the printer, as shown in Figure 15. Make sure that Switch 2 of the rear panel DIP Switch is set to OFF. If using the GPIB interface, connect one end of the GPIB cable to the GPIB port on the rear panel of the printer, as shown in Figure 16. Connect the other end to the GPIB connector on the test set being used. Secure the cable with the captive screws provided on the ends of the cable. Set Switch 2 of the rear panel DIP Switch to ON.
5	Push the POWER button on the 5902 Printer. Verify that the switch/ indicator illuminates; verify that the ON-LINE LED illuminates.
6	Push the ON-LINE switch once. Verify that the ON-LINE LED is off. Push the SELF-TEST switch once. The self-test takes about 30 seconds to complete. Verify that the self-test is completed successfully (END-OF-PAPER LED not flashing). Push the ON-LINE switch once; verify that the ON-LINE LED illuminates.

TABLE F (CON'T)

POWER-UP PROCEDURE

STEP	PROCEDURE
7	Configure the test set's serial data format to include 7 bits per character if using a parity bit, or 8 bits per character if not using a parity bit. Set up the test set's baud rate to match the printer's baud rate.
8	Turn on the test set being used. Activate the proper controls on the front panel of the test set to access the printer. Run the test; verify that the test results are printed. NOTE: At the end of a test, the printer will automatically feed out enough paper to make all of the test results viewable. When a second test is performed, the printer will retract the paper and print the test results directly above the results of the previous test. This action saves paper and allows all lines of print to be read easily without having to manually feed paper.

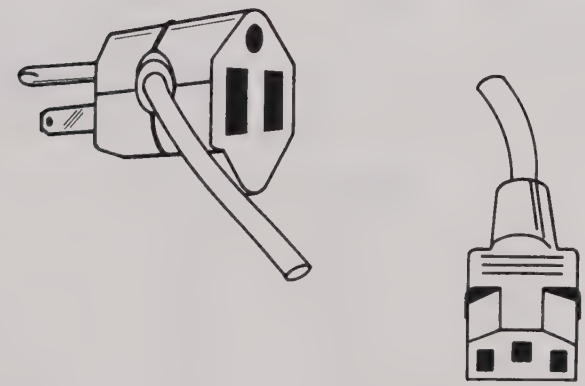


Fig. 13 - Power Cord

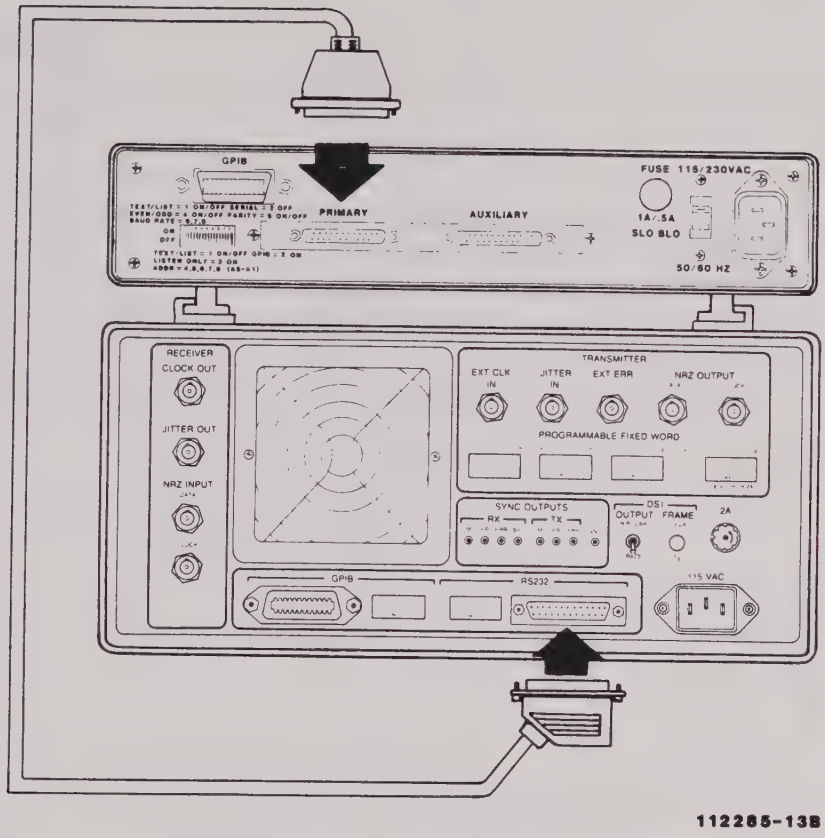


Fig. 14 - Serial Interface Cable Connections

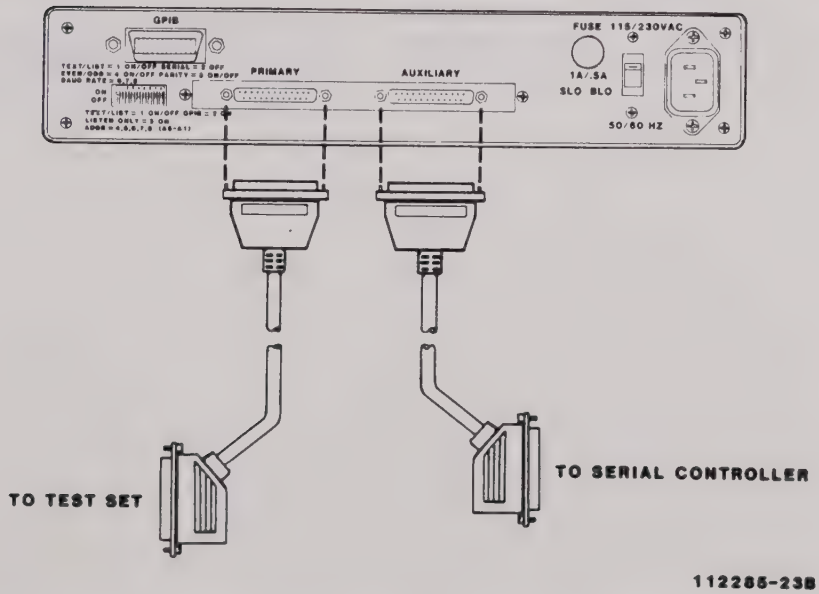


Fig. 15 - Auxiliary Port/Serial Controller Cable Connections

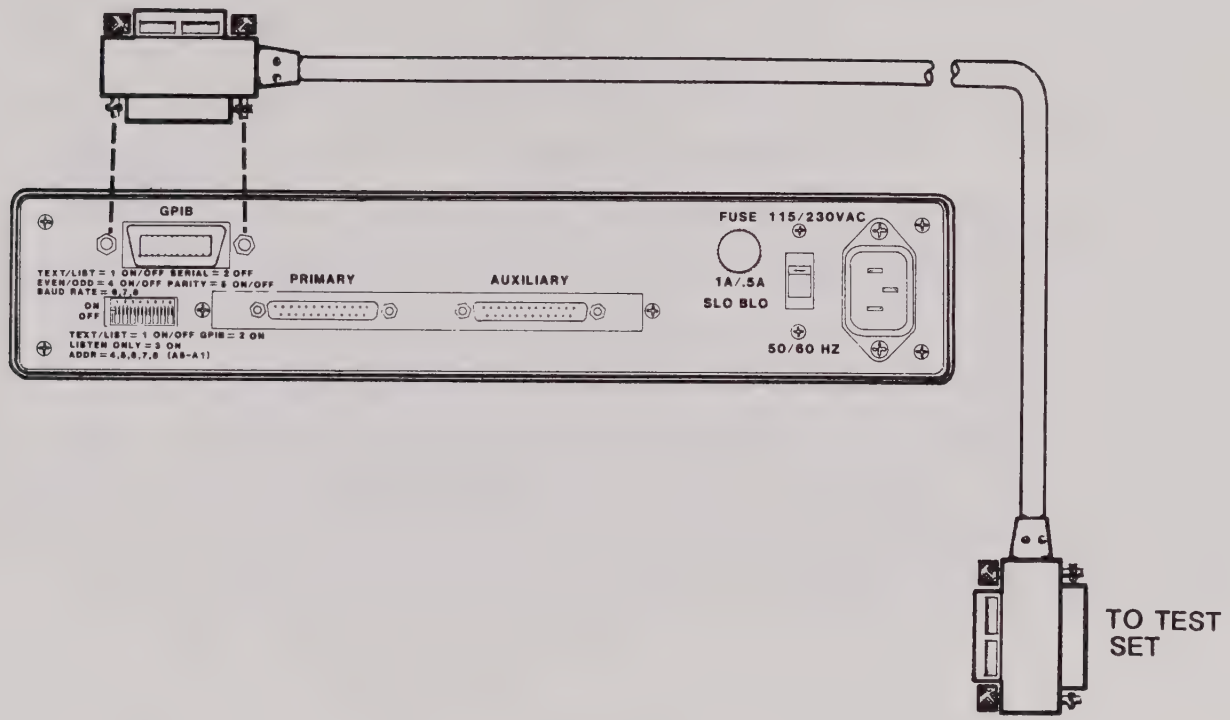


Fig. 16 - GPIB Interface Cable Connections

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G. Software Commands

3.11 The 5902 will recognize 96 of the 128 7-bit ASCII characters as printable. Table G specifies the printable ASCII character set and its respective Hex Codes. Table H specifies which ASCII characters are interpreted as control characters.

TABLE G

ASCII CHARACTER SET

MOST SIGNIFICANT DIGIT	LEAST SIGNIFICANT DIGIT															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2	SP	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{	¦	}	~	DEL

TABLE H

CONTROL CHARACTERS

ASCII	HEX	ACTION
LF	0A	Line Feed -- advances 1 character line, or prints contents of line buffer if not empty, and advances to the next character line. NOTE: If a Line Feed follows a carriage return, the Line Feed is ignored.
CR	0D	Carriage Return -- prints the contents of the input line buffer and advances to the next character line. NOTE: If a Line Feed follows a carriage return, the Line Feed is ignored.
FF	0C	Form Feed -- advances the paper by six lines. Prints contents of the line buffer if not empty, then advances the paper.

TABLE H (CON'T)

CONTROL CHARACTERS

ASCII	HEX	ACTION
STX	02	Start of Text -- software reset. Re-initializes system (similar to power on reset), reads the rear panel DIP switch, and empties the internal buffer.
GS	1D	Initiate SELF TEST, as described in Section 3, Table A. (Printer must be off-line.)
NOTE: All other control codes are ignored.		

4. SERVICE AND MAINTENANCE

A. Assistance

4.01 For service assistance, please call the Tau-tron Customer Service Department at (617)-692-5100 or 1-800-TAU-TRON (outside MA). Their experience and expertise can often save you valuable time in correcting any equipment malfunction.

B. Repair Returns

4.02 If it is determined that the 5902 Printer must be returned to the factory for repair, use the Repair Returns Card at the back of this manual and follow the directions to ensure prompt service.

C. General Troubleshooting

4.03 This section provides guidelines for locating and correcting the majority of simple faults which may be encountered on Tau-tron's 5902 Printers. Table I lists faults and their probable causes or remedies.

WARNING: Do not attempt to access the inner printed boards without first disconnecting the line cord from the power receptacle.

TABLE I

GENERAL TROUBLESHOOTING GUIDE

FAULT	PROBABLE CAUSES/REMEDIES
No Power	1. Line cord not securely plugged into unit. 2. Fuse is blown. Check and replace if necessary. 3. AC source faulty. Try another receptacle. 4. 115 V/230V Select switch set incorrectly.
No Printout	1. Printer is off-line. 2. Printer Operating Mode DIP switch set for the wrong interface. Check and RESET unit. 3. Interface cables not securely installed. 4. Out of paper. Check END OF PAPER indicator and reload if necessary. 5. Head release lever is in the LOAD position. Check END OF PAPER flashing and correct if necessary. (See Section 4 for paper replacement instructions.) 6. Baud rate setting is incorrect. Check Printer Operating Mode DIP switch, reconfigure if necessary, and RESET unit. 7. Printer not turned on. 8. RESET the printer. 9. DCE/DTE improperly selected.

TABLE I (CON'T)

GENERAL TROUBLESHOOTING GUIDE

FAULT	PROBABLE CAUSES/REMEDIES
Garbled Printout	1. Incorrect baud rate. Check printer operating mode DIP switch. Change baud rate if necessary (see Section 3, Table B, No. 7) and RESET unit. 2. Data source at fault (incorrect baud rate, bits per character, stop bits, output connections, etc.) 3. Paper not properly aligned during loading.
SELF-TEST inoperative	1. Printer is ON-LINE. 2. Check for END OF PAPER flashing during SELF TEST. If flashing at 10 Hz, a RAM or ROM failure is indicated. Return printer for service.
PAPER FEED inoperative	1. Head release lever is in the LOAD position. Check END OF PAPER flashing at 1 Hz and correct if necessary (see paper replacement instructions.)
Paper appears darkened	1. Indicates prolonged storage above 50°C (+122°F).
Red stripes appear on edges of paper	1. Only 3 feet (.9m) of paper remaining.

D. Paper Replacement

4.04 To facilitate paper replacement, refer to the procedure detailed in Table J. (An instruction decal is also provided on the printer plate.) Figure 17 provides a front view of the print mechanism and illustrates the paper retainer. Figure 18 illustrates the head release lever and the paper feed path.

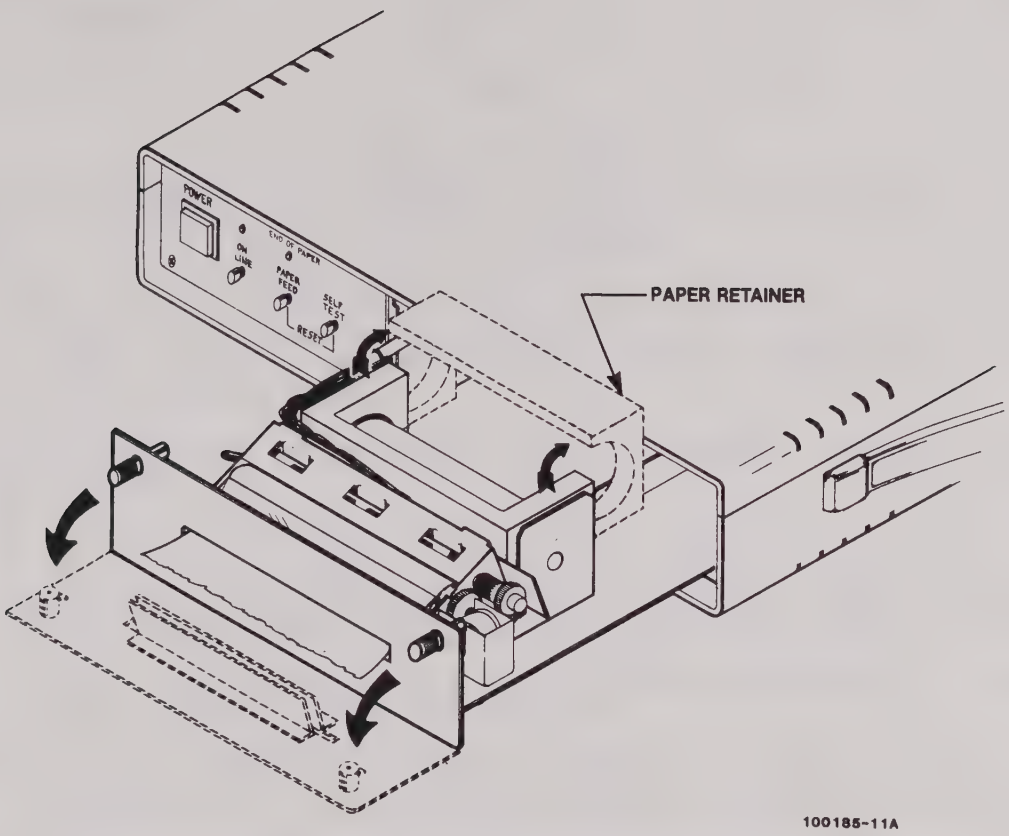


Fig. 17 - Printer Mechanism Front View

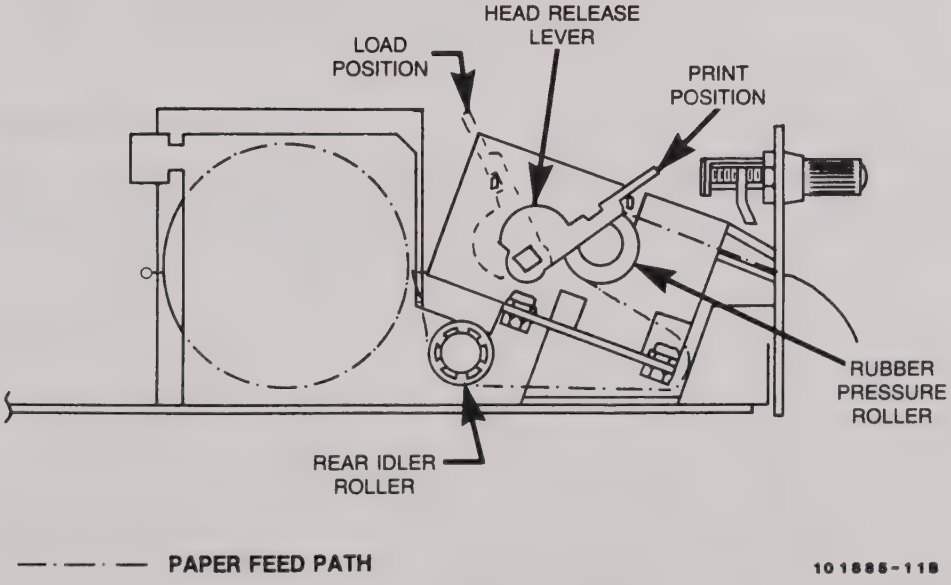


Fig. 18 - Printer Mechanism Side View

TABLE J

PAPER REPLACEMENT

STEP	PROCEDURE
1	Turn the thumbscrews on the front panel counterclockwise about six turns. Let the panel fold forward. Slide the print mechanism forward until it hits the stops.
2	Push the head release lever to the LOAD position. Pull out the remaining paper.
3	Lift the paper retainer. Remove the old paper core and discard.
4	Place the new roll of paper into position with the paper feeding off the top. Fold the paper into a V-shape and make sharp creases.
5	Thread paper under the rear idler roller and under the mechanism. Lower the paper retainer onto the roll.
6	Use the PAPER FEED switch to thread the paper under the rubber pressure roller and out at the top between the roller and the printhead.
7	Feed the paper through the slot in the front panel. Make sure that the paper is centered in the mechanism and aligned properly.
8	Pull the head release lever back to the PRINT position. Raise the front panel and slide the print mechanism back into the housing. Turn the thumbscrews clockwise to lock the panel into place.

E. Printhead Maintenance

4.05 Head cleaning should be done periodically depending on amount of use and operating conditions. To clean the printhead, soak approximately 12 in. (30.5 cm) of paper with medical grade isopropyl alcohol, and feed the paper through the print mechanism once or twice without printing.

SECTION 5

SPECIFICATIONS

5. SPECIFICATIONS

5.01 This section describes, in Table K, the physical, electrical, and technical specifications of the 5902 Printer. All accessories and options are listed in this section. Specifications are subject to change without notice.

TABLE K

SPECIFICATIONS

PRINT CHARACTERISTICS Type:	High speed thermal, Microprocessor controlled
Print Rate:	1.2 lines per second/72 lines per minute minimum
Line Length:	40 characters per line (character lines in excess of 40 characters are wrapped around and printed on the next line).
Line Density:	5.1 lines per in. (2.0 lines per cm)
Character Density:	12 characters per in. (.47 characters per mm)
Character Size:	5x7 dot matrix, .097 in. (2.4 mm) H x .069 in. (1.75 mm) W
Character Set:	Standard 96 ASCII character set includes all upper and lower case letters, numbers, punctuation, and special symbols specified in ANSI X3.4-1977. 5 control characters (Line Feed, Carriage Return, Form Feed, Start of Text, and Initiate Self Test).
Paper:	Thermal sensitive, 4-3/8 in. (11.1 cm) W x 90 ft (27.4 mm) roll
Printhead Life:	4 million lines (160 million characters minimum)
FRONT PANEL Controls and Indicators:	POWER on/off pushbutton with red LED indicator PAPER-FEED pushbutton (momentary) ON-LINE pushbutton (alternate action selects on-line/off-line)

TABLE K (CON'T)

SPECIFICATIONS

FRONT PANEL Controls and Indicators: (Con't)	ON-LINE green LED indicator SELF-TEST pushbutton END-OF-PAPER red LED indicator
INTERFACE CHARACTERISTICS General: Baud Rate: Parity: Interfaces: Optional Interface:	 Simultaneous acceptance of data and printing 1024-byte input buffer Busy line DCE/DTE selectable Externally selectable from 110 to 9600 bits per second Externally selectable, Odd/Even/None RS-232C or RS-449 (one Primary port, one Auxiliary port) IEEE-488 (GPIB) Addressable and Listen Always
REAR PANEL General: Connectors:	 AC Line Receptacle Externally Accessible AC fuse Operating Mode DIP Switch RS-232C: 25-pin D-type connectors, female (x2) RS-449: 37-pin D-type connectors, female (x2) IEEE-488 (GPIB): 24-pin connector, female (optional)
POWER Line Voltages: Frequency Range: Power Consumption: Fuses:	 Externally selectable 110/220 VAC (+/- 10%) 47 to 440 Hz Idle 20W Printing 37W 110 Vac 1A Slo-Blo Type 3AG 220 Vac ½A Slo-Blo Type 3AG

TABLE K (CON'T)

SPECIFICATIONS

MECHANICAL Dimensions:	Width - 12-3/4 in. (324.0 mm) Height - 2-5/8 in. (66.7 mm) Depth - 11-1/8 in. (283.0 mm)
Weight:	Net Weight - 12 lb (5.45 kg) Shipping Weight - 17 lb (7.72 kg)
ENVIRONMENTAL Ambient Operating Temperature:	0°C to +50°C (+32° to +122°F)
Storage Temperature:	-55°C to +85°C (-67° to +185°F)*
Relative Humidity Range:	20% to 90% (non-condensing)
*NOTE: Paper will darken with prolonged storage above 50°C (+122°F).	
ACCESSORIES Supplied:	AC power cord Front cover Operations manual RS-232C cable (if RS-232C Interface installed) RS-449 cable (if RS-449 Interface installed) GPIB (IEEE-488) cable (if GPIB installed) One extra roll of thermal print paper Stac-Trac Mounting Kit
OPTIONS	
OP-02	IEEE-488 (GPIB) Interface: For use with GPIB-equipped instrumentation
OP-05	RS-449 Interface
OP-07	Thermal Print Paper: Box of ten, 4-3/8 in. (11.1 cm) W, 90 ft (27.4m) rolls
OP-10	Small, Soft Carrying Case: Accommodates the 5902 Printer only
OP-11	Large, Soft Carrying Case: Accommodates both a 5902 Printer and a Test Set

APPENDIX A

RS-232C INTERFACE

A. General

A.01 This section provides detailed information on the RS-232C serial interface. The following topics are covered:

- Interface Connections
- Serial Data Format

B. Interface Connections

A.02 Two 25-pin D-connectors on the rear panel support the primary and auxiliary RS-232C interfaces. Each is wired in accordance with RS-232C standards for full duplex communication. Both ports are jumper selectable (internally accessible ganged jumpers) to function either as Data Terminal Equipment (DTE) or as Data Communication Equipment (DCE). Table L specifies primary interface connections for both DTE and DCE operation. Table M specifies auxiliary interface connections for both DTE and DCE operation.

TABLE L

RS-232C PRIMARY INTERFACE CONNECTIONS

DTE		DCE		FUNCTION
Name	Pin	Name	Pin	
GND	1	GND	1	Protective ground (chassis ground)
GND	7	GND	7	Signal ground (common return)
TXD	2	RXD	3	Primary Data Output. Bit-serial data stream received at Auxiliary Data Input is output on this line.
RXD	3	TXD	2	Primary Data Input. Bit-serial data to be printed is received on this line. Data on this line is accepted only if the printer is powered-up, on-line, and not busy. The printer provides a busy signal when out of paper or when its input data buffer is full. Data input on this line is output on Auxiliary Data Output line.
RTS	4	DCD	8	Primary Data Available for Output. High level input (>3 Vdc) indicates device connected to auxiliary interface has data to send to device connected to Primary Data Output.

TABLE L (CON'T)

RS-232C PRIMARY INTERFACE CONNECTIONS

DTE		DCE		FUNCTION
Name	Pin	Name	Pin	
CTS	5	DTR	20	Ready for Primary Output Data. High level input (>3 Vdc) indicates device connected to primary port is ready to accept data on the Primary Data Output line.
DTR	20	CTS	5	Ready for Primary Input Data. High level output (>3 Vdc) indicates printer is ready to accept and print data on Primary Input Data line. This line will be high only if the printer is powered-up, on-line, and not busy and if the Ready for Auxiliary Data Output line is high. The absence of a device connected to the auxiliary port will not inhibit this signal from going active. The printer will force this signal inactive (<-3 Vdc) when it is out of paper, off-line, or when its input buffer is full.
DCD	8	RTS	4	Primary Data Available for Input. High level input (>3 Vdc) indicates device connected to primary port has data to be received and printed.
DSR	6	DSR	6	Data Set Ready. High level output (>3 Vdc) on this line when primary port is functioning as DCE and power is on. When primary port is functioning as DTE, input on this line is ignored.

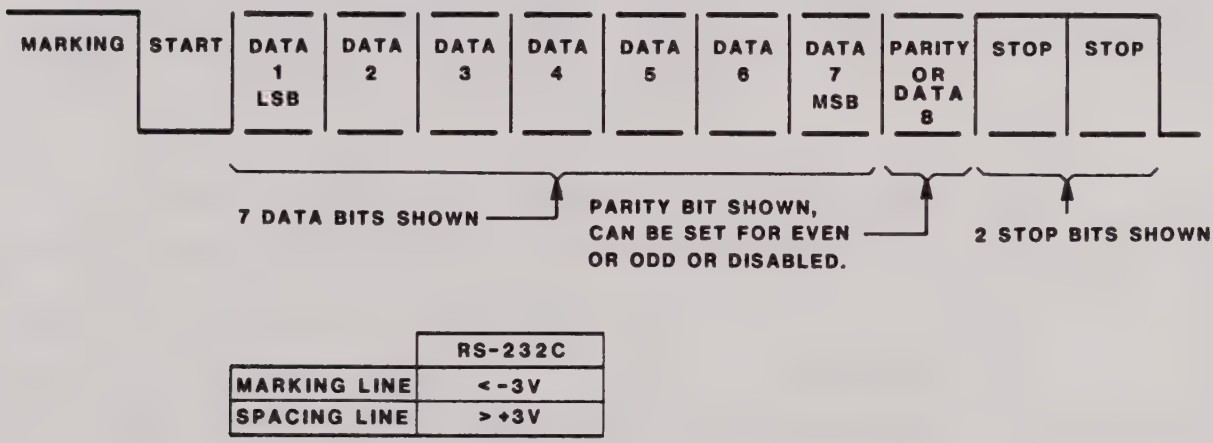
TABLE M

RS-232C AUXILIARY INTERFACE CONNECTIONS

DTE		DCE		FUNCTION
Name	Pin	Name	Pin	
Gnd	1	Gnd	1	Protective Ground. (chassis ground)
Gnd	7	Gnd	7	Signal Ground. (common return)
RXD	3	TXD	2	Auxiliary Data Input. Bit-serial data stream on this line is output on Primary Data Output line.
TXD	2	RXD	3	Auxiliary Data Output. Bit-serial data stream received on Primary Data Input and printed is output on this line.
DCD	8	RTS	4	Auxiliary Data Available for Input. High-level input (>3 Vdc) indicates device connected to auxiliary port has data to send to primary port. This auxiliary input is connected to the Primary Data Available for Output line.
DTR	20	CTS	5	Ready for Input Data. High-level output (>3 Vdc) indicates device connected to primary port is ready to accept data from device connected to auxiliary port.
CTS	5	DTR	20	Ready for Auxiliary Output Data. High-level input (>3 Vdc) indicates device connected to auxiliary port is ready to accept data from device connected to primary port. This signal must be active unless explicitly forced inactive by the device connected to the auxiliary port.
RTS	4	DCD	8	Auxiliary Data Available for Output. High-level output (>3 Vdc) indicates device connected to primary port has data to send to device connected to auxiliary port.
DSR	6	DSR	6	Data Set Ready. High-level output (>3 Vdc) on this line when auxiliary port is functioning as DCE and power is on. When auxiliary port is functioning as DTE, input on this line is ignored.

C. Serial Data Format

A.03 Data is input to the printer in an asynchronous bit-serial fashion at one of eight selectable baud rates. The format of a typical bit-serial data stream is shown in Figure 19. An important aspect of asynchronous bit-serial data streams is that there must be a total of 8 bits between the start bit and the stop bit. These may be 8 data bits, or 7 data bits plus 1 parity bit. Furthermore, either 1 or 2 stop bits may be used. In the case where there are only 7 data bits, no parity bit, and no 8th data bit, two stop bits MUST be used. The first stop bit is interpreted by the printer as the 8th data bit (which is necessary to fulfill the 8-bit requirement). The second stop bit will be the one that is acted upon. In cases where there are either 7 data bits and 1 parity bit, or 8 data bits, only 1 stop bit is necessary, although 2 stop bits may be used without any appreciable effect.



	RS-232C
MARKING LINE	< -3V
SPACING LINE	> +3V

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Fig. 19 - Serial Data Format and RS-232C Interface Voltages

APPENDIX B

RS-449 INTERFACE

A. General

B.01 This section provides detailed information on the RS-449 serial interface. The following topics are covered:

- Interface Connections
- Serial Data Format

B. Interface Connections

B.02 Two 37-pin D-connectors on the rear panel support the primary and auxiliary RS-449 interfaces. Each is wired in accordance with RS-449 standards for full-duplex communication. Both ports are jumper selectable to conform to the electrical characteristics of either RS-422 (Balanced Voltage) or RS-423 (Unbalanced Voltage) Digital Interface Circuits, and are also jumper selectable to function as either Data Terminal Equipment (DTE) or Data Communication Equipment (DCE). Table N specifies primary interface connections (DCE and DTE) for RS-422 operation. Table O specifies primary interface connections (DCE and DTE) for RS-423 operation. Table P specifies auxiliary interface connections (DCE and DTE) for RS-422 operation. Table Q specifies auxiliary interface connections (DCE and DTE) for RS-423 operation.

TABLE N

PRIMARY INTERFACE CONNECTIONS FOR RS-422 OPERATION

DTE		DCE		FUNCTION
Name	Pin	Name	Pin	
Shield	1	Shield	1	Ground
SC	19	RC	20	Signal Ground
TxD TxDC	4 22	RxD RxDC	6 24	Primary Data Output Complement
RxD RxDC	6 24	TxD TxDC	4 22	Primary Data Input Complement
RTS RTSC	7 25	DCD DCDC	13 31	Primary Data Available for Output (Request To Send) Complement

TABLE N (CON'T)

PRIMARY INTERFACE CONNECTIONS FOR RS-422 OPERATION

DTE		DCE		FUNCTION
Name	Pin	Name	Pin	
CTS	9	DTR	12	Ready for Primary Data Output (Clear To Send)
CTSC	27	DTRC	30	Complement
DTR	12	CTS	9	Ready for Primary Data Input (Data Terminal Ready)
DTRC	30	CTSC	27	Complement
DCD	13	RTS	7	Primary Data Available for Input
DCDC	31	RTSC	25	Complement
DSR	11	DSR	11	Data Set Ready (Active for DCE when printer is powered up.)
DSRC	29	DSRC	29	Complement

TABLE O

PRIMARY INTERFACE CONNECTIONS FOR RS-423 OPERATION

DTE		DCE		FUNCTION
Name	Pin	Name	Pin	
Shield	1	Shield	1	Ground
SC	19	RC	20	Signal Ground
TxD	4	RxD	6	Primary Data Output
TxDC	22	RxDC	24	Internally connected to signal ground

TABLE O (CON'T)

PRIMARY INTERFACE CONNECTIONS FOR RS-423 OPERATION

DTE		DCE		FUNCTION
Name	Pin	Name	Pin	
RxD	6	TxD	4	Primary Data Input
RxDC	24	TxDC	22	Internally connected to signal ground
RTS	7	DCD	13	Primary Data Available for Output (Request To Send)
RTSC	25	DCDC	31	Internally connected to signal ground
CTS	9	DTR	12	Ready for Primary Data Output (Clear To Send)
DTSC	27	DTRC	30	Internally connected to signal ground
DTR	12	CTS	9	Ready for Primary Data Input (Data Terminal Ready)
DTRC	30	CTSC	27	Internally connected to signal ground
DCD	13	RTS	7	Primary Data Available for Input
DCDC	31	RTSC	25	Internally connected to signal ground
DSR	11	DSR	11	Data Set Ready (Active for DCE when printer is powered up.)
DSRC	29	DSRC	29	Internally connected to signal ground

TABLE P

AUXILIARY INTERFACE CONNECTIONS FOR RS-422 OPERATION

DTE		DCE		FUNCTION
Name	Pin	Name	Pin	
Shield	1	Shield	1	Ground

TABLE P (CON'T)

AUXILIARY INTERFACE CONNECTIONS FOR RS-422 OPERATION

DTE		DCE		FUNCTION
Name	Pin	Name	Pin	
SC	19	RC	20	Signal Ground
TxD	4	RxD	6	Primary Data Output
TxDC	22	RxDC	24	Complement
RxD	6	TxD	4	Primary Data Input
RxDC	24	TxDC	22	Complement
RTS	7	DCD	13	Primary Data Available for Output (Request To Send)
RTSC	25	DCDC	31	Complement
CTS	9	DTR	12	Ready for Primary Data Output (Clear To Send)
CTSC	27	DTRC	30	Complement
DTR	12	CTS	9	Ready for Primary Data Input (Data Terminal Ready)
DTRC	30	CTSC	27	Complement
DCD	13	RTS	7	Primary Data Available for Input
DCDC	31	RTSC	25	Complement
DSR	11	DSR	11	Data Set Ready (Active for DCE when printer is powered up.)
DSRC	29	DSRC	29	Complement

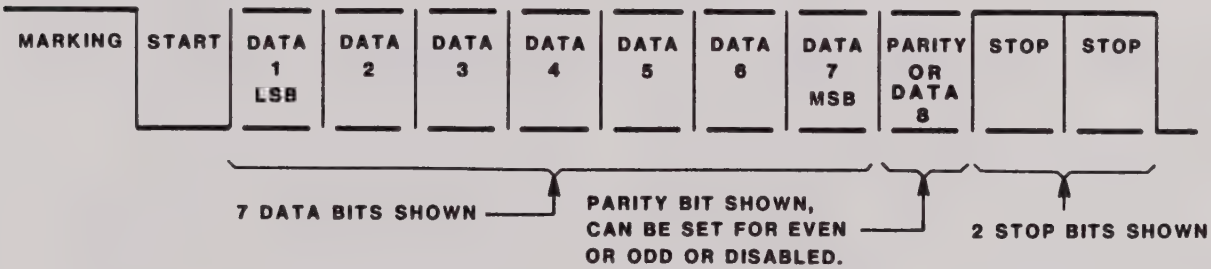
TABLE Q

AUXILIARY INTERFACE CONNECTIONS FOR RS-423 OPERATION

DTE		DCE		FUNCTION
Name	Pin	Name	Pin	
Shield	1	Shield	1	Ground
SC	19	RC	20	Signal Ground
TxD TxDC	4 22	RxD RxDC	6 24	Primary Data Output Internally connected to signal ground
RxD RxDC	6 24	TxD TxDC	4 22	Primary Data Input Internally connected to signal ground
RTS RTSC	7 25	DCD DCDC	13 31	Primary Data Available for Output (Request To Send) Internally connected to signal ground
CTS CTSC	9 27	DTR DTRC	12 30	Ready for Primary Data Output (Clear To Send) Internally connected to signal ground
DTR DTRC	12 30	CTS CTSC	9 27	Ready for Primary Data Input (Data Terminal Ready) Internally connected to signal ground
DCD DCDC	13 31	RTS RTSC	7 25	Primary Data Available for Input Internally connected to signal ground
DSR DSRC	11 29	DSR DSRC	11 29	Data Set Ready (Active for DCE when printer is powered up.) Internally connected to signal ground

C. Serial Data Format

B.03 Data is input to the printer in an asynchronous bit-serial fashion at one of eight selectable baud rates. The format of a typical bit-serial data stream is shown in Figure 20. An important aspect of asynchronous bit-serial data streams is that there must be a total of 8 bits between the start bit and the stop bit. These may be 8 data bits, or 7 data bits plus 1 parity bit. Furthermore, either 1 or 2 stop bits may be used. In the case where there are only 7 data bits, no parity bit, and no 8th data bit, two stop bits MUST be used. The first stop bit is interpreted by the printer as the 8th data bit (which is necessary to fulfill the 8-bit requirement). The second stop bit will be the one that is acted upon. In cases where there are either 7 data bits and 1 parity bit, or 8 data bits, only 1 stop bit is necessary, although 2 stop bits may be used without any appreciable effect.



	RS-449/423	RS-449/422
MARKING LINE	< -3.6V	< -2.0V
SPACING LINE	> +3.6V	> +2.0V

111985-12B

Fig. 20 - Serial Data Format and RS-422/RS-423 Interface Voltages

APPENDIX C

IEEE-488 (GPIB) INTERFACE

A. General

C.01 This section provides detailed information on the IEEE-488 (GPIB) interface. The following topics are covered:

- Description of the IEEE-488 General Purpose Interface Bus
- 5902 Printer GPIB Capabilities
- GPIB Address and Option Selection
- Response to GPIB Commands
- Unsupported GPIB Commands
- Pinouts

B. Description of IEEE-488 (GPIB)

C.02 The GPIB (General Purpose Interface Bus) transfers data and commands between the units of an instrumentation system on 16 lines. The interface functions for each unit are performed within the unit so only passive cabling is necessary to connect the system. The cables connect all instrument controllers and other units of the system in parallel across the signal lines.

C.03 Eight of the lines (DIO 1 through DIO 8) are reserved for the transfer of data and other messages in a byte-serial, bit-parallel manner. Data and message transfer is asynchronous and coordinated by the three handshake lines: DAV (data valid), NRFD (not ready for data), and NDAC (not data accepted). The other five lines are for control of bus activity.

C.04 Devices connected to the bus may be talkers, listeners, or controllers. The controller dictates the role of each of the other units by setting the ATN (attention) line and sending talk or listen addresses on the data lines (DIO 1 through DIO 8). Addresses are set into each device at the time of system configuration either by switches built into the unit or by jumpers on a printed circuit board. While the ATN line is true, all units must listen to the data lines. When the ATN line is false, only devices that have been addressed will actively send or receive data. All others ignore the data lines.

C.05 Several listeners can be active simultaneously, but only one talker can be active at a time. Whenever a talk address is put on the data lines (while ATN is true), all other talkers should automatically be unaddressed.

C.06 Information is transmitted on the data lines under sequential control of the three handshake lines. No step in the sequence can be initiated until the previous step is completed. Information transfer can proceed as fast as units can respond, but no faster than allowed by the slowest device being addressed as active. This permits several devices to receive the same message byte concurrently.

C.07 The ATN line is one of five control lines. When ATN is true, addresses and universal commands are transmitted on only seven of the data lines using ASCII code. When ATN is false, any code of 8 bits or less that is understood by both the talker and the listener(s) can be used.

C.08 The other control lines are: IFC, REN, SRQ, and EOI. IFC (interface clear) places the interface system in a quiescent state. REN (remote enable) is used with other coded messages to select either local or remote control of each unit. Any active unit can set the SRQ (service request) line

to true. This indicates to the controller that some unit on the bus wants attention; for example, a counter on a bus may want attention because it has just completed a time-interval measurement and wants to transmit the reading to a printer. EOI (end or identify) is used by a unit to indicate the end of a multiple-byte transfer sequence. When a controller sets both ATN and EOI lines to true, each unit capable of a parallel poll indicates its current status on the data line (DIO 1 through DIO 8) assigned to it. It is not necessary that every unit be capable of responding to all of the lines. Each unit can be designed to respond only to those lines that are pertinent to its functions on the bus.

C. 5902 Printer GPIB Capabilities

C.09 The 5902 Printer may be interfaced as an addressable listener or always listen (listen only). No controller functions are implemented. The 5902 is designed to interpret data as printable, but is not designed to be controlled by the bus. As described in the IEEE-488-1978 (GPIB) standard, the following GPIB capabilities are implemented:

SH0 - No source handshake capability

AH1 - Complete accepter handshake capability

T0 - No talker capability

TE0 - No extended talker (secondary talk address) capability

L1 - Basic listener, listen only, capability

LE0 - No extended listener (secondary listen address) capability

SR0 - No service request capability

RL0 - No remote/local capability

PP0 - No parallel poll capability

DC1 - Complete device clear capability

DT0 - No device trigger capability

C0 - No control capability

D. GPIB Address and Option Selection

C.10 When Option 02, IEEE-488 Interface (GPIB) is installed, a 24-pin GPIB connector is provided on the rear panel of the 5902 Printer. Connector dimensions and pinouts correspond to IEEE specifications. The 8-section DIP switch on the rear panel is used for GPIB listen address and option selection as specified in Table R.

TABLE R

GPIB ADDRESS AND OPTION SELECTION

DIP SWITCH POSITION	FUNCTION
1. Print Direction	ON (closed) = Text mode is selected OFF (open) = List mode is selected
2. Interface Selection	ON (closed) = GPIB interface selected OFF (open) = RS-232C/RS-449 interface selected

TABLE R (CON'T)

GPIB ADDRESS AND OPTION SELECTION

DIP SWITCH POSITION	FUNCTION
3. Listen Only	ON (closed) = Listen only (always addressed) mode. Printer will accept and print all data transferred on the DIO lines when the ATN signal is inactive.
4. Address A5 5. Address A4 6. Address A3 7. Address A2 8. Address A1	A1 through A5 plus two additional bits; A2 is the next most-significant bit, etc. The two additional bits are the most significant bits and are fixed as 0-1 for a listen address. A1 through A5 are ignored if the listen only (listen always) function is selected.
NOTE: The DIP SWITCH IS READ ONLY ON POWER-UP, OR WHEN A PRINTER RESET IS INITIATED. To change the printer's GPIB address or other characteristics, the printer must be RESET or must be turned OFF, then back ON again.	

E. Response to GPIB Commands

C.11 The 5902 Printer responds to the following GPIB commands and events:

- Printer addressed to listen
- Universal unlisten commanded
- Data byte received
- Interface clear commanded
- Device clear commanded.

These GPIB commands and events are detailed in the following paragraphs.

Printer Addressed to Listen

C.12 When MLA (my listen address) (Figure 21) is present on the GPIB bus, the printer will be addressed to listen. If the printer has been powered up in its Listen Only mode, MLA will be ignored. All data received on the DIO lines is printed when the printer has been addressed to listen or is in its Listen Only mode.

CODE	DATA BUS DIO 8 7 6 5 4 3 2 1	INTERFACE MANAGEMENT ATN EOI SRQ IFC REN
MLA	Y 0 1 L L L L L 5 4 3 2 1	1 x x x x

L1-L5 specify the device dependent bits of the device's listen address as set by the rear-panel DIP switch.

Fig. 21 - MLA (My Listen Address)

Universal Unlisten Command

C.13 When UNL (unlisten) (Figure 22) is present on the GPIB bus, the printer will cease to listen and addressed commands (SDC) and data will be ignored. Universal commands (IFC and MLA) will continue to be recognized and responded to. Unlisten is ignored if the printer is in its Listen Only mode.

CODE	DATA BUS DIO 8 7 6 5 4 3 2 1	INTERFACE MANAGEMENT ATN EOI SRQ IFC REN
UNL	Y 0 1 1 1 1 1 1	1 x x x x

Fig. 22 - UNL (Unlisten)

Data Byte Received

C.14 When the ATN (attention) (Figure 23) line is inactive and the printer is addressed to listen, bytes received on the eight DIO lines will be interpreted as ASCII data to be printed. An input buffer of 1024 characters is provided. The printer is capable of printing data while more data is being received. When the input buffer is full, additional data will not be accepted until there is room in the buffer for it.

CODE	DATA BUS DIO 8 7 6 5 4 3 2 1	INTERFACE MANAGEMENT ATN EOI SRQ IFC REN
ATN	x x x x x x x x	1 x x x x
DAB	D D D D D D D D 8 7 6 5 4 3 2 1	0 x x x x

D1-D8 specify the device dependent data bits.
The source of the message on the ATN line is always the C function, whereas the messages on the DIO and EIO lines are enabled by the T function.

Fig. 23 - ATN (Attention)

Interface Clear Commanded

C.15 When the IFC (interface clear) line (Figure 24) is asserted on the GPIB bus, the printer reinitializes its interface functions as described by IEEE-488-1978 state diagrams. Previously received data in the print buffer will not be lost when IFC is received. Printer operation is not reset when IFC is received.

CODE	DATA BUS DIO 8 7 6 5 4 3 2 1	INTERFACE MANAGEMENT ATN EOI SRQ IFC REN
IFC	x x x x x x x x	x x x 1 x

Fig. 24 - IFC (Interface Clear)

Device Clear Commanded

C.16 The printer may be cleared by DCL (universal device clear) or SDC (selective device clear) (Figure 25). SDC is accepted by the printer only if it has been addressed to listen. DCL is responded to in any mode. In response to a device clear command, the printer reinitializes its print function, including clearing its input buffer. However, GPIB interface functions are NOT reinitialized (e.g., if addressed to listen, DCL does not cause it to be unaddressed).

CODE	DATA BUS DIO 8 7 6 5 4 3 2 1	INTERFACE MANAGEMENT ATN EOI SRQ IFC REN
DCL	Y 0 0 1 0 1 0 0	1 x x x x
SDC	Y 0 0 0 0 1 0 0	1 x x x x

Fig. 25 - DCL (Universal Device Clear) and SDC (Selective Device Clear)

F. Unsupported GPIB Commands

C.17 Several GPIB capabilities are not supported by the 5902 Printer. A list of these unsupported commands is as follows:

- Local Lockout (LLO)
- Remote enable (REN)
- Go to local (GTL)
- Addressed to talk (MTA)

- Universal untalk (UNT)
- Serial poll enable (SPE)
- Serial poll disable (SPD)
- Identify (IDY)
- My Secondary Address (MSA)
- Other Secondary Address (OSA)
- Parallel Poll Configure (PPC)
- Parallel Poll Unconfigure (PPU)
- Parallel Poll Enable (PPE)
- Parallel Poll Disable (PPD)
- Group Execute Trigger (GET)
- Take Control (TCT).

The occurrence of these commands on the bus is ignored at all times. Undefined GPIB commands received with the ATN line asserted are also ignored.

G. Pinouts

C.18 Pinouts for the IEEE-488 (GPIB) interface are given in Table S.

TABLE S

IEEE-488 (GPIB) PINOUTS

PIN	SIGNAL LINE	PIN	SIGNAL LINE
1	DIO 1	13	DIO 5
2	DIO 2	14	DIO 6
3	DIO 3	15	DIO 7
4	DIO 4	16	DIO 8
5	EOI (24)	17	REN (24)
6	DAV	18	GND, (6)
7	NRFD	19	GND, (7)
8	NDAC	20	GND, (8)
9	IFC	21	GND, (9)
10	SRQ	22	GND, (10)
11	ATN	23	GND, (11)
12	SHIELD	24	GND, LOGIC

NOTE: GND, (n) refers to the signal ground return of the referenced pin. EOI and REN return on pin 24.

APPENDIX D

CABLE DESCRIPTIONS

A. General

D.01 This section provides illustrations and descriptions of the RS-232C, RS-449, and IEEE-488 (GPIB) interface cables supplied with the 5902 Printer.

B. RS-232C Interface Cable

D.02 The RS-232C interface cable is equipped with 25-pin D-connectors (male) on each end, as shown in Figure 26. One end of the RS-232C cable utilizes a right-angle connector. This end should be connected to the test set. The RS-232C cable uses only lines 1, 2, 3, 4, 5, 6, 7, 8, and 20.

C. RS-449 Interface Cable

D.03 The RS-449 interface cable is equipped with 37-pin D-connectors (male) on each end, as shown in Figure 27. One end of the RS-449 cable utilizes a right-angle connector. This end should be connected to the test set. The RS-449 cable uses only lines 1, 4, 6, 7, 9, 11, 12, 13, 19, 20, 22, 24, 25, 27, 29, 30, and 31.

D. IEEE-488 (GPIB) Cable

D.04 The IEEE-488 (GPIB) interface cable is equipped with standard 24-pin IEEE-488 (GPIB) connectors (male) on each end, as shown in Figure 28. The connectors are fitted with a pair of captive locking screws to assure a reliable connection.

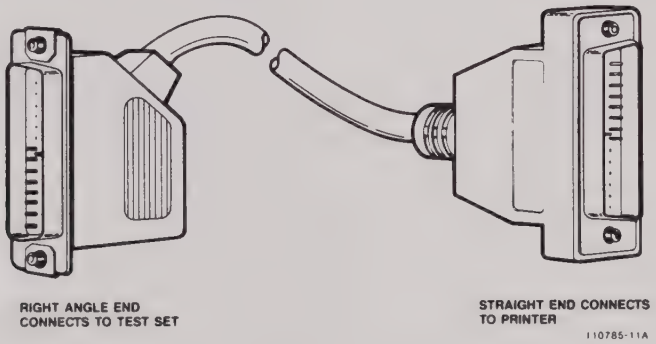


Fig. 26 - RS-232C Interface Cable

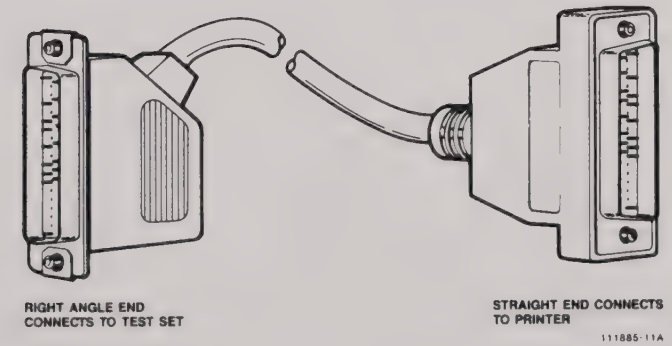


Fig. 27 - RS-449 Interface Cable

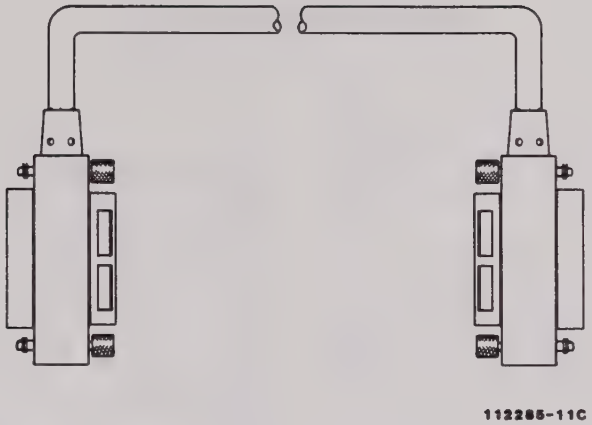


Fig. 28 - IEEE-488 (GPIB) Cable

APPENDIX E

STAC-TRAC MOUNTING

A. General

E.01 This section provides instructions for mounting the 5902 Printer onto a test set using the Stac-Trac Mounting Kit included with the printer.

E.02 The Stac-Trac Mounting Kit can be used with the S5104, the S5200E, and the S5250. The kit includes two male and two female rails, six flathead screws, two panhead screws, two nylon washers, and four nylon-tipped set screws.

B. Rail Installation

E.03 The female rails are installed onto the top cover of the test set. Remove the front two panhead screws on the top cover of the test set. Line up the holes on the rails with the holes in the cover of the test set. Secure the rails by using two flathead screws for the front two holes and two panhead screws (with nylon washers) for the back two holes, as shown in Figure 29. Install the four nylon-tipped set screws into the holes provided for them in the female rails, as shown in Figure 29.

E.04 The male rails are installed onto the bottom cover of the printer, which comes equipped with four press nuts. The "long end" of the rails should be installed toward the front of the printer, as shown in Figure 29. The rails are secured by using four flathead screws.

C. Mounting

E.05 After the rails have been installed, the printer is ready to be mounted onto the test set. Line up the rails on the printer with the rails on the test set. Slide the printer into position, and push it all the way back until it hits the stops. Secure the printer by tightening the four nylon-tipped set screws.

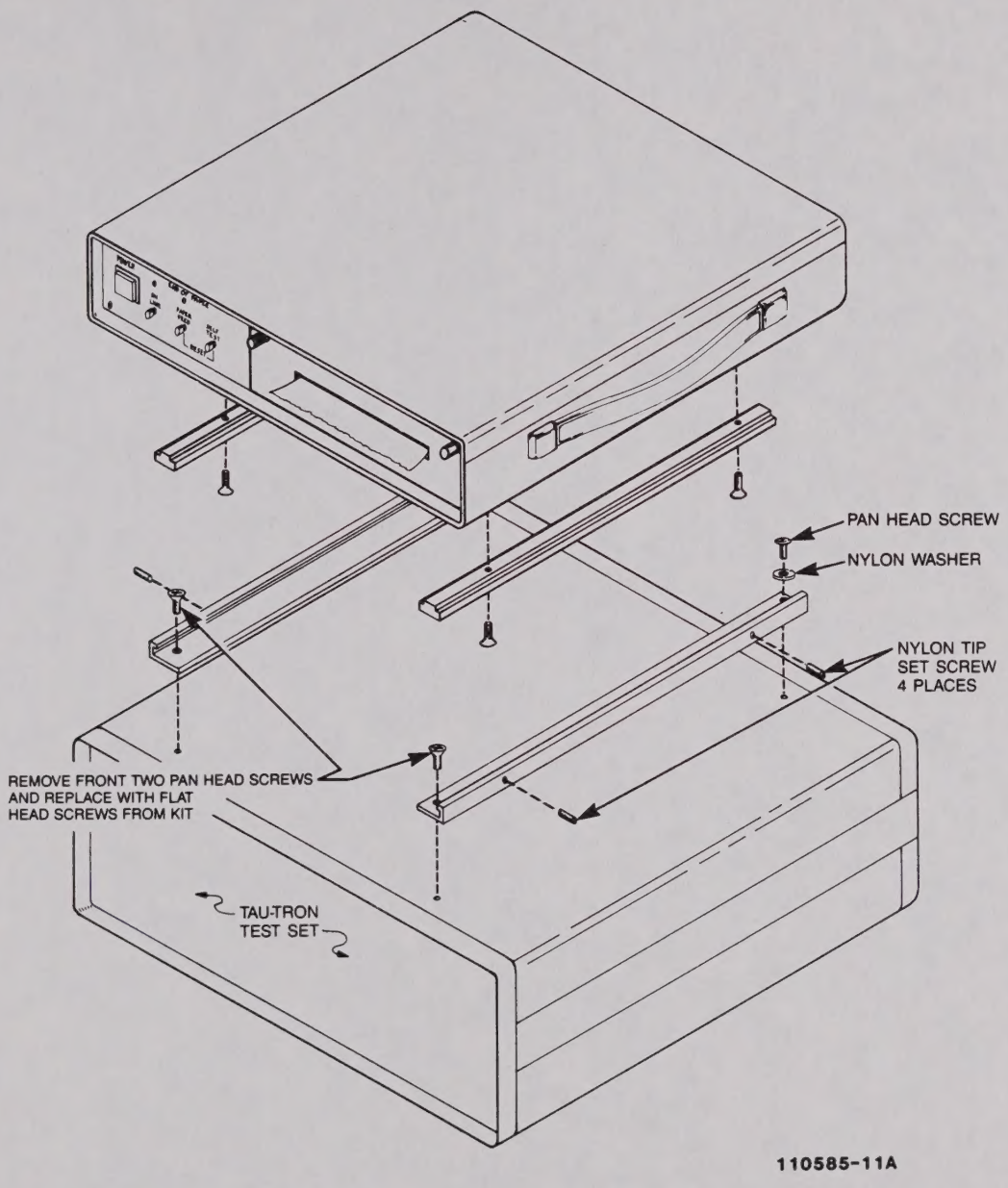


Fig. 29 - Stac-Trac Mounting

ACCOPRESS®

25170	YELLOW
25171	BLACK
25172	LIGHT BLUE
25173	DARK BLUE
25174	LIGHT GRAY
25175	LIGHT GREEN
25176	DARK GREEN
25177	TANGERINE
25178	RED
25179	EXECUTIVE RED

WITH WATER RESISTANT
PRESSTEX® COVERS

ACCO INTERNATIONAL INC.
CHICAGO, ILLINOIS 60619